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REVIEWS

august 2014 volume 12 no. 8
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MICROBIOLOGY



HOW SISTERS GROW APART

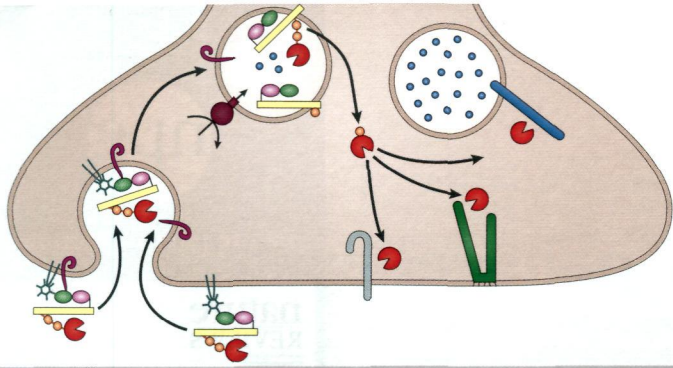
Growth and division of mycobacteria

Structures and mechanisms of botulinum neurotoxins

Persistent paralysis

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Botulinum neurotoxins hijack nerve terminals p535

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FEATURED
ARTICLE

Botulinum neurotoxins: genetic, structural and mechanistic insights

Ornella Rossetto, Marco Pirazzini and Cesare Montecucco

Botulinum neurotoxins, which are the most powerful known toxins, are produced by toxigenic clostridia and cause persistent paralysis of peripheral nerve terminals by blocking neurotransmitter release. In this Review, Montecucco and colleagues discuss recent structural and molecular insights into the mechanisms of toxin entry into nerve terminals, membrane translocation and neuroparalysis.

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How sisters grow apart: mycobacterial growth and cell division

Karen J. Kieser and Eric J. Rubin

Compared with traditional model bacteria, the processes of growth and division are unusual in mycobacteria. In this Review, Rubin and Kieser discuss polar growth, asymmetric division and cell wall remodelling in mycobacteria and consider how these processes might contribute to the population heterogeneity and pathogenesis of *Mycobacterium tuberculosis*.

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Adding new dimensions: towards an integrative understanding of HIV-1 spread

Oliver T. Fackler, Thomas T. Murooka, Andrea Imle and Thorsten R. Mempel

Although studies in 2D cell culture systems have provided great insights into the biology and pathogenesis of HIV-1 infection, such studies cannot account for many aspects of host physiology that affect HIV-1 *in vivo*. Fackler *et al.* discuss the development and application of more integrative studies, including organotypic 3D culture systems, small-animal models and advanced live-cell imaging, and the impact of such studies on our understanding of the mechanisms of HIV-1 spread.

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The molecular arms race between African trypanosomes and humans

Etienne Pays, Benoit Vanhullebeke, Pierrick Uzureau, Laurence Lecordier and David Pérez-Morga

Humans can resist infection by African trypanosomes, owing to the trypanolytic activity of apolipoprotein L1 (APOL1), which is associated with two serum complexes, trypanosome lytic factor 1 (TLF1) and TLF2. *Trypanosoma brucei rhodesiense* and *Trypanosoma brucei gambiense* evade this defence mechanism by expressing resistance proteins and in turn, populations in western Africa can restore resistance to *T. b. rhodesiense* via sequence variation in APOL1. Pays *et al.* review this complex relationship and its evolutionary importance.

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Joseph T. Wade and David C. Grainger

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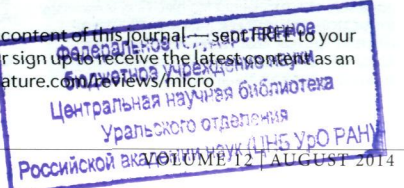
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OPINION

585 **Models matter: the search for an effective *Staphylococcus aureus* vaccine**

Wilmara Salgado-Pabón and Patrick M. Schlievert

The development of a vaccine against *Staphylococcus aureus* infection has been the subject of an intensive research effort, but none of the vaccine trials has been successful so far. In this Opinion article, the authors suggest that an over-reliance on mouse models and a focus on targeting cell surface components have been major contributing factors to this failure.



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